ROCKY FLATS PLANT
JEFFERSON COUNTY, COLORADO

DRAFT
TECHNICAL REVIEW OF PHASE I
RCRA FACILITY INVESTIGATION/REMEDIAL INVESTIGATION
WORK PLAN FOR OPERABLE UNIT 4

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 8 Federal Facilities Remedial Branch
Denver, Colorado

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) requested PRC Environmental Management, Inc. (PRC) conduct a technical review of the draft work plan for the Phase I Resource Conservation and Recovery Act (RCRA) facility investigation/remedial investigation (RFI/RI) of the solar evaporation ponds, identified as operable unit (OU) 4 at the U.S. Department of Energy (DOE) Rocky Flats Plant (RFP). The draft phase I RFI/RI work plan (draft work plan) was submitted by CH2M Hill on behalf of the DOE. PRC reviewed the document under the Technical Enforcement Support (TES) 12 contract number 68-W9-0009, work assignment number C08057.

PRC's technical review of the draft phase I work plan addresses problems associated with the evaluation of historical analytical data, the field investigation plan, and the risk assessment portion of the work plan. The technical review comments are divided into general comments addressing the overall phase I work plan, and specific comments keyed to specific sections of the work plan.

2.0 GENERAL COMMENTS

The interagency agreement (IAG) identifies the solar evaporation ponds as OU4. The draft work plan addresses this OU as OU3, which should be globally corrected throughout the work plan.

Section 2.0 for the draft work plan omits detail necessary to evaluate the chemical characterization of the site. The distinction between borehole samples and soil samples is not clear. Although volatile organic compounds (VOCs) were not detected in the 1986 borehole samples, 1,1-dichloroethane (DCA), chloroform, 1,1,1-trichloroethane (TCA), and trichloroethene (TCE) were all detected in 1986 soil samples. These contaminants are all halogenated VOCs. The text should be clarified as appropriate. In addition, it may not be appropriate to compare 1986 and 1989 background soil/vadose zone analytical results. The 1986 analytical results are from nine composite samples in the top 12 inches of soil. The 1989 analytical results are from 70 samples in the alluvial sediment. Depths of sampling and composites, including replicates and duplicates, should be specified for the 1989 sampling to evaluate the comparison to 1986 data. Also, background samples from alluvium or the top 12 inches of soil should not be considered as appropriate "background" samples for stream sediment, colluvium, or bedrock samples. Furthermore, if a detected concentration exceeds the corresponding statistically determined tolerance limit of the "background" range, it is not appropriate to dismiss the elevated concentration as background variability where concentrations exceed tolerance limits. These concentrations should be considered an indication of contamination. The text only includes concentrations exceeding the upper limit of the background range by a factor greater than 3.

Task 1 of the field investigation/sampling plan (Section 4.0) addresses the compilation of additional available information on facilities associated with the solar evaporation ponds. In addition to this data compilation, the occurrence and volume of liquids existing within the ponds at specific times throughout it's historical use should be estimated and provided in the data compilation. If accurate records of process waste holding at the ponds are unavailable, then the use of aerial photographs and photogrammetry may supplement such information. Furthermore, any volumetric estimates of process waste liquids released by pond leakage prior to the installation of the french drain system (1980) would be useful in conjunction with assessing the areal extent of contaminated soils in the vadose zone.

The characterization of the vadose zone should account for the occurrence of soil moisture and perched subsurface water. The draft phase I work plan should incorporate soil moisture profiling as part of the characterization of the vadose zone materials. This information will enable a clearer understanding of the fate and transport of contaminants in the vadose zone, which should be addressed in the phase II RFI/RI.

Section 4.4.3 of the field investigation/sampling plan describes the approach of the soil/vadose zone investigations (Task 4), where a total of 27 soil/vadose zone borings will be drilled in the vicinity of the solar evaporation ponds 207-A, 207-B (North, Central, and South), and 207-C. The last paragraph of this section describes the collection of discrete water samples from boreholes if free (perched) subsurface water is encountered. However, the one-time discrete sampling of water within the auger flights would not be truly representative of the perched zone. A more representative sample could be collected through the use of a HydroPunch sampler, well point, or other non-dedicated sampling device. At sampling locations where the quantity of water is insufficient to warrant the use of these types of sampling devices, the installation of a lysimeter may be more appropriate. Since the vadose zone is defined as the unsaturated subsurface interval between the ground surface and the water table, including perched ground water zones, soil moisture profiling and sampling perched zones by using HydroPunch sampling, well points, or lysimeters should be an integral part of the soil/vadose zone investigation.

The "Baseline Risk Assessment Plan" presented in Appendix D of the draft work plan is not a risk assessment work plan. It does not outline the site-specific approach and assumptions to determine the effects on human health and the environment of the RFP solar evaporation ponds. Instead, Appendix D summarizes EPA guidance for conducting a risk assessment under the

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (EPA, 1989a). No site-specific information or considerations are presented. Possible exposure pathways and potential receptors are not defined, potential contaminants of concern are not identified, and preliminary exposure assumptions are not defined.

The conceptual model presented in Section 3.1 identifies potential pathways, exposure routes, and receptors but states that discussion of these is not within the scope of the work plan. Other site-specific information pertinent to the risk assessment is presented in various sections of the body of the work plan (for example, five communities including the Denver metropolis are identified within 20 miles of the site in Section 2.0). However, none of this information is included in Appendix D. Enough information apparently exists to define some preliminary pathways and receptors, and to develop preliminary scenarios. Information collected during the phase I investigation will then focus the assessment on the most important pathways, which will be further evaluated in phase II of the RFI/RI.

3.0 SPECIFIC COMMENTS

1. Page D-1, Introduction, second paragraph. The objectives of the risk assessment should be clearly stated. As written, they are confusing and possibly misleading. For example, "Toxicity and levels of hazardous substances present in relevant media" is not an objective as stated. Determining the type and severity of toxicity and the carcinogenic potential associated with the contaminants of concern by means of a literature search is an objective.

   Rationale: Carefully defined objectives will guide the risk assessment. They should be well defined to evaluate whether they are, in fact, appropriate to the site in question and, ultimately, whether and to what extent they are met by the risk assessment.

2. Page D-3, first sentence. Contaminant identification is listed as the first of four components of risk assessment. Reference to EPA guidance for risk assessment under Superfund (EPA, 1989a) is appropriate here, in which case the task of contaminant identification is a component of data collection and evaluation.

   Rationale: The terminology as defined by EPA is more explicit than that used in the work plan. It describes the overall process, as well as conforming to EPA guidance for risk assessment. See the following comment.

3. Page D-3, Contaminant Identification. This section should describe how data will be evaluated and what quality level of data will be used in the risk assessment. For example, "screening data will be used for identification of classes of contaminants but only level-IV data will be used for risk assessment calculations." Also, this section should state what percentage of data will be validated, whether contract laboratory program (CLP) procedures will be used for analysis, what data gaps exist, and so on, or it should reference the appropriate section of the work plan if this information is contained elsewhere. The compounds known to have been disposed of in the solar evaporation ponds and mentioned elsewhere in the work plan should be listed here as potential contaminants of concern with any information regarding whether they are known to have migrated from the ponds. Because the ponds are known to have contained radionuclides, the procedures to deal with them should be stated because there are no methods included in the CLP statement of work (SOW) for radionuclides.

   Rationale: Reiteration of the EPA guidance without inclusion of site-specific considerations is a wasted effort. The work plan should provide an outline of the actual assumptions,

parameters, pathways, and receptors that will be considered in the risk assessment and should include explicit notations identifying data gaps.

4. Page D-3, Exposure Assessment. Reference to the site conceptual model is needed. The individual components of the four elements of exposure pathways should be discussed with specific reference to the solar evaporation ponds. This section should propose the pathways to be considered in the assessment based on site characteristics. The phase I data will then demonstrate which pathways may be eliminated from further consideration.

Rationale: See the rationale under specific comment 3.

5. Page D-4, Exposure Assessment. As stated before, information presented elsewhere in the document relevant to the topics listed under actions in the risk assessment process, including discussions of human populations in the area, potential pathways, and current and future land use conditions could be expanded with site-specific detail. Exposure parameters could be proposed from established guidance (EPA, 1989a; EPA, 1989b) for possible on- or off-site scenarios (developed during the phase II RFI/RI), such as inhalation of windblown soil contaminants by residents in the nearby community of Arvada.

Rationale: See rationale under specific comment 3.

6. Page D-4, Exposure Assessment. A generic equation should be presented so that calculated exposure methods can be evaluated and verified for compliance with EPA guidance. Site-specific considerations should be included where possible. For example, dermal contact is listed in the site conceptual model as a potential pathway. The type of soil at RFP shall be considered to develop an adherence factor. A description of the way radionuclide doses will be calculated should also be provided and a reference to the appropriate guidance should be made.

Rationale: See rationale under specific comment 3.

7. Page D-5, Exposure Assessment. Information is included elsewhere in the work plan for many listed factors including contaminant source, local topography, and local meteorological data. Reference to the appropriate sections should be made. Specific mention of pertinent facts for the risk assessment scenarios should be made, such as the predominant wind direction and its relationship to the surrounding communities.

Rationale: See rationale under specific comment 3.

8. Page D-5, Toxicity Assessment. The existing text seems to imply all studies will be summarized, which would be a formidable task. It may be useful to use the following phrase: "a summary of any toxicological studies for chemicals of concern."

Rationale: A precise description of assessment approaches and actions is important to demonstrate sound understanding of the task and to promote a proper assessment focus.

9. Page D-7, Risk Characterization, first paragraph. Risk characterization involves integration of the assessment of exposure, both quantitative and qualitative, and toxicity information. The exposure assumptions are integrated into the assessment of contaminant intakes. The first statement should be reworded.

The reasonable maximum exposure (RME) should be defined as stated in the guidance (EPA, 1989a) with particular reference to site-specific conditions. The RME is assumed to include reasonable maximum components for contact rate, exposure frequency, and exposure duration (EPA, 1989a). This discussion should actually appear in the section on exposure assessment.

There is no rationale to calculate subchronic and chronic intakes for each route of exposure (again a discussion more appropriate to the exposure assessment section). While this may be appropriate based on site-specific conditions, some basis for this approach should be provided other than that the effects may be different. It is not clear why a particular pathway would be associated with two levels of contaminant concentrations.

Rationale: Work plan language should be precise to reflect an understanding of the task. The RME has a precise definition according to the guidance but must be modified for site-specific conditions. For example, a very mobile population may not have the same reasonable-maximum residence time as a very stable population.

Extraneous calculations confuse and obscure the overall assessment. Careful reasoning should be presented for the reasons the site may be associated with very different levels of exposure for the same pathway and thus require two sets of calculations for noncarcinogenic effects of contaminants.

10. Page D-8, Environmental Evaluation, last sentence. The term "biomarkers" is misused both here and on the following page and the misuse indicates a misunderstanding of the term.

Biomarkers are not an "activity," nor are they indicators of an effect beyond the individual level. They are a biochemical or physiological response in an individual organism to a physical or chemical insult. "Population-ecosystem density, diversity, or nutrient cycling" as stated on page D-9 as being endpoints "measured in individual organisms," are not, in fact, measured in individual organisms (although organisms may be sampled) and are not related to biomarkers. Biomarkers indicate an effect at the individual level. This cannot be extrapolated to the population, community, or ecosystem level. It may contribute to an evaluation of effects based on several measurements at different levels in the ecosystem. Biomarkers may be detected at the individual level and changes in nutrient cycling may be detected at the ecosystem level, but the causes may be different and unrelated. Also, "tissue residues" of a contaminant are not a biomarker as stated on page D-9. While exposure may be verified by a tissue concentration, there may be no effect. For example, arsenic-resistent organisms may concentrate arsenic in particular tissues where it is unavailable to the organism and has no effect. In fact, it may be used as a protective mechanism against predation.

Rationale: See the discussion on pages 2-18 and 2-19 of the EPA guidance for ecological assessment (EPA, 1989c). Note that the guidance lists tissue concentrations and biomarkers separately in Table 2-4 under individual measurement endpoints. The guidance is specific in that there are currently no models to relate biomarkers to higher level effects.

11. Page D-9, Environmental Evaluation, first paragraph. Aquatic and terrestrial field surveys are planned. No sampling plans or discussion is presented on the development of sampling plans, the criteria to be used for selecting species for sampling, or the methods to use the information collected to demonstrate an effect from contaminants migrating from the solar evaporation ponds. There is no discussion of how the surveys will differentiate the overall effects of RFP from effects resulting strictly from the solar evaporation ponds. This differentation will promote the proper evaluation of remedial alternatives. An overall RFP assessment may be appropriate and an assessment that focuses specifically on the solar evaporation ponds could be designed to contribute to an overall RFP assessment.

Rationale: A very general approach is described and good ideas are presented, such as use of a background creek area for comparison. But not enough specific methods and criteria are presented to determine whether the approach will be effective. For instance, no criteria are given for determining if any differences between the background stream and the test stream are a result of contamination or unrelated effects, such as microclimate effects or geohydrology effects. If insufficient information is currently available for developing a

sampling plan, a phased approach should be proposed. The evaluation does not appear to have been carefully planned. The result of sampling a variety of organisms with no clear goals or criteria could be a large expenditure of money and time with no useful results.

4.0 REFERENCES

EPA, 1989a, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA/540/1-89/001.

EPA, 1989a, Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual. EPA/540/1-89/001.

EPA, 1989b, Exposure Factors Handbook. EPA/600/8-89/001.

EPA, 1989c, Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference. EPA/600/3-89/013.